

REMARKS

Claims 12-23 and 31-34 are all the claims pending in the application. Claims 20-23 and 31-34 are rejected. Claims 12-19 are allowed.

Claim Rejections - 35 U.S.C. § 102

Claims 20, 22, 31 and 33 are rejected under 35 U.S.C. § 102(a) as being anticipated by Farrokhnia et al (6,694,047). This rejection is traversed for at least the following reasons.

The Examiner has repeated the basis for rejection of these claims at pages 2-7 of the present Office Action. The Examiner has provided a Response to arguments at pages 9-14 of the present Office Action.

With respect to independent claims 20, 22, 31 and 33, the rejected claims concern a medical image processing apparatus (20, 31) and method (22, 33) for evaluating image quality of a radiation image. The method and apparatus concerns the evaluation of the QC phantom, but only in connection with a quantitative evaluation, where both visual as well as quantitative evaluation portions appear on the QC phantom.

Claim 20

In the previous amendment, Applicants argued that claim 20 specifies that the medical image processing apparatus contains several components for inspecting a radiation imaging system using a QC phantom, and relying on a difference in the linear direction and rotational direction. Those components include (1) a comparison and calculation means that calculates a difference in the linear direction and the rotational direction, (2) a search area changing means that changes the search area on the basis of an amount of difference in the linear direction and the rotational direction calculated by the comparison and calculation means, and (3) a

determination criterion changing means changes a determination criterion on the basis of an amount of difference in the linear direction and the rotational direction calculated by the comparison and calculation means.

Farrokhnia et al '047

The Examiner asserts that Farrokhnia et al '047 teaches all of the limitations in the claim and, in the Response to Arguments at pages 9-14 of the Office Action, specifically asserts that Farrokhnia et al teaches what the Applicant argued as a basis for patentability.

No Use of Linear Direction and Rotational Direction

The Examiner asserts that there is a teaching of the use of linear direction and rotational direction, specifically at col. 7, lines 26-35 where it is stated that “the fiducials 240 may thus aid in determining the orientation and positioning of the coupon phantom 200 as well as aid in separating and locating the various sub-phantoms for example, a phantom measuring parameters A and B may have a different shape, size and orientation of fiducials than a phantom measuring parameters B and C”. The Examiner also points to col. 11, lines 36-39 for a teaching that “Although the location of the perimeter ring has been determined at step 710, the location of the other phantom components is not necessarily known due to errors in positioning and rotation, for example.” In connection with these statements, the Examiner asserts that the phrase “orientation and positioning” refers to a linear direction (“positioning”) and a rotational direction (“orientation”).

The cited text simply acknowledges that errors can occur based on linear and rotational orientation of the image. The cited text does NOT teach or suggest that any rotational direction compensation occurs. Indeed, as subsequently discussed, there is no teaching or suggestion of

correction for both a rotational direction and linear direction, and the thrust of the disclosure in the prior art is simply a linear correction.

No Comparison and Calculating Means

The Examiner asserts that the comparison and calculating means is disclosed at col. 12, lines 52-63 because Farrokhnia et al also states there that “Because the locations of the vertical and horizontal line segments are known and the spatial relationship of the vertical and horizontal lines on the phantom is also known, the aspect ratio of the tracked vertical and horizontal line segments may be compared with the aspect ratio of the physical phantom.” The Examiner asserts that this is a calculation based on a difference in a linear direction and a rotational direction, where the known spatial relationship comprises orientation and positioning of the phantom.

Applicants respectfully submit that the locations referenced by the cited text is solely linear, and in any event, makes no specific reference to an orientation, or rotational direction. The cited text refers to the horizontal and vertical segments 140 of Fig. 1 and the attempt to determine the locations of those segments in separate process steps of Fig. 7, where Fig. 8 illustrates the determination for vertical segments for step 750 and Fig. 9 illustrates a determination for horizontal segments for step 760. There is no consideration of a rotational direction in these figures. Step 770 concerns a detection and tracking of equally spaced points on each line segment and an extension of the search area corresponding to the vertical and horizontal line segments surrounding the step intensity sub-phantom. The Examiner’s reference to the description at col. 12 of a verification of aspect ratios in step 780 and a comparison of an aspect ratio of the tracked segments with that of the physical phantom is unavailing, as it appears

to be focused solely on the aspect ratio of horizontal and vertical segments, without reference to their orientation or rotation. Thus, Applicants respectfully submit that the Examiner has not demonstrated that the reference teaches reliance on a rotational direction, or a combination of linear direction or rotational direction.

Determination Criterion Change Based on Difference in Linear Direction and Rotational Direction

Applicants previously noted that the Examiner appears to consider the steps of changing the regions of interest (ROI) in each of the successive steps of the disclosed flow charts 1700 in Fig. 17 to meet this limitation. Applicants argued that there is no determination criteria used to calculate a difference that serves to change the determination criterion used for determining image quality. Moreover, Applicants noted that this limitation has been amended to specify the changing of the determination criteria on the basis of an amount of difference in a linear direction and a rotational direction. Applicants argued that the cited art does not teach a corresponding reliance on a difference in both a linear direction and a rotational direction.

At pages 10 and 11 of the present Office Action, the Examiner attempts to rebut the argument that there is no reliance on a difference in both linear direction and rotational direction for other structural limitations of the claims by referring to the description at page 34 with respect to step S6. This rebuttal appears to be based on a reference to position differences that may be purely linear. However, the argument, if properly understood, is not relevant. Other teachings of the invention and the express language of the claims relates to the use of both linear direction and rotational direction. As already demonstrated, this limitation is not taught in the prior art.

The Examiner also seems to be asserting that there is a use of a changed determination criterion (region 33 in Fig. 11B), rather than an initial determination criterion (region 32 in Fig. 11A) and admits that the determination criterion changing section 441 reads out the criterion and changes the criterion based on the amount of position difference of the phantom image in the parallel (linear) direction and rotational direction. Again, this argument based on Applicants' teachings is not understood, as the claims expressly require reliance on both a difference in a linear direction and a rotational direction. There is no teaching or suggestion in Farrokhnia et al of this limitation.

Further, as a basis for asserting that there is a difference in linear and rotational direction used, the Examiner points to a teaching at col. 12, line 64 – col. 13, line 16 that polynomial warping is employed to develop a working estimate of the line segments, and the ROI's are positioned relative to the working estimate. However, Applicants respectfully submit that the reliance on polynomial warping is itself a relationship to a purely linear position without consideration of rotation. The problem is warping and not rotation. Thus, there is no teaching or suggestion from this application that a consideration of both linear direction and rotational direction should be considered. Rotation problems are not compensated by warping polynomials. Moreover, warping is not compensated by rotation. In sum, the mention of "polynomial warping" does NOT include correction for a rotational direction, but is limited to correction for every linear direction.

No Determination Means

In the previous amendment, Applicants noted that the Examiner is pointing to the teachings at col. 13, line 46 - col. 15, line 60 for the "determination means" set forth in claim 20,

and that the Examiner looks to the same teaching for both the determination criteria changing means (which Applicants assert is not present) and the determination means. Applicants asserted that the same structure in the prior art reference cannot be cited for a disclosure of two distinct and structurally related limitations. Applicants also asserted that, even if the Examiner argues that there are two separate means, on the basis of a determination of image quality by using the physical amount calculated by the physical amount calculating means, it is not calculated on the basis of the determination criterion changed by the determination criterion changing means. Applicants asserted that two separate structural and functional elements are required, and the prior art teachings relate to only a single structure, and that structure does not meet either limitation.

The Examiner notes the Applicants' arguments and observes that Applicants appear to be arguing that the prior art passage cited by the Examiner cannot disclose more than one structure, and disagrees, asserting that a single sentence can disclose multiple distinct structures. Applicant would not disagree with this basic statement and withdraw this argument.

However, Applicants continue to assert that the determination means, which relies on determination criterion changed by the determination criterion changing means, necessarily depends on a difference in the linear direction and the rotational direction calculated by the comparison and calculating means. Since this limitation is not present in the teachings of Farrokhnia et al, the claim limitation cannot be met.

Claim 31

The foregoing arguments, based on the absence from the prior art of at least three limitations in the claims, would apply to claim 31.

Claims 22 and 33

Again, Applicants would assert that independent claim 22 and corresponding method claim 33 are not anticipated by the teachings in Farrokhnia et al '047.

The “position detecting means,” “comparison and calculating means,” “physical amount calculating means” and “determination means” are the same as found with respect to claim 20. Applicants’ comments above with regard to the “comparison and calculating means” would apply because this “means” is expressly limited to a calculation of an amount difference in a **linear direction and rotational direction**. As demonstrated above, and as supplemented by arguments provided by the Applicants, there is no such teaching in Farrokhnia et al '047 and the Examiner is extending the teachings of the reference beyond the disclosure in the specification and drawings of the reference. In short, there is no teaching of a reliance on amount difference in a **linear direction and rotational direction**.

As to the “image correcting means,” Applicants argued that the recited limitation has the function of correcting the position of the phantom in the radiation image so that the amount of difference **calculated by said comparison and calculating means** is reduced. Applicants argued that the claim expressly states that the position of the phantom in the radiation image is corrected, “so that the amount of **difference in the linear direction and the rotational direction** calculated by said comparison and calculating means is reduced.” Applicants asserted that this limitation is not taught in the prior art and, thus, this claim cannot be anticipated, nor would it be obvious.

The Examiner disagrees in comments at pages 13 and 14 of the Office Action, asserting that the amount of difference is reduced on the basis of the teaching of polynomial warping

correction at col. 12, lines 37-51. However, even if a “best fit” is applied in Farrokhnia et al, the process is limited to a linear fit based on polynomial warping, which does not consider a reduction in difference in rotational direction and certainly does not consider a reduction in difference in the combination of both linear direction and rotational direction.

As previously noted, the mention of “polynomial warping” does NOT include correction for a rotational direction, but is limited to correction for every linear direction. Thus, a “best fit” based on polynomial warping would not involve a reduction in the amount of difference in both rotational direction and linear direction.

This same analysis would apply to independent method claim 33.

Claim Rejections - 35 U.S.C. § 103

Claims 21, 23, 32 and 34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Farrokhnia et al (6,694,047) in view of Lang (2002/0067798). This rejection is traversed for at least the following reasons.

The Examiner asserts that with regard to these dependent claims, the apparatus and method of Farrokhnia et al. '047 lacks control means for controlling notification of a maintenance center of existence of an abnormality when the determination means has determined that the abnormality of the image quality exists in the radiation image. The Examiner looks to Lang for a teaching at paragraph 7-23 that expert images and/or data can be distributed over a network to a variety of different recipients for further analysis and/or action. Thus, the Examiner finds it obvious to combine the references to obtain a network for distributing extra images and/or data to a variety of recipients, and asserts that this may include a maintenance center.

Applicants again would submit that the Lang reference does not remedy the basic deficiencies already cited in the parent claims with regard to Farrokhnia et al. '047.

The Examiner disagrees with the foregoing statement, presumably on the basis that Farrokhnia et al does teach the elements alleged by Applicants to be missing. However, the Examiner does not point to any teaching or suggestion in Lang that would show reliance on both linear distances and rotational distances, and in particular, differences in such parameters, to provide an indication of image quality, as claimed.

Thus, claims dependent on allowable claims 20, 22, 31 and 33 (21, 23, 32 and 34) are allowable as well.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,
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